We claim:

1. A method for measuring the rise time of an x-ray pulse, comprising:

providing a dielectric material that has a material property of having zero effective reflectance at a wavelength λ_1 directed onto said dielectric material;

directing an x-ray pulse onto an area of said dielectric material to produce a reflectivity change in said dielectric material, wherein said x-ray pulse has sufficient energy to alter the reflectivity of said dielectric material at said wavelength λ_1, wherein said reflectivity changes from a minimum to a maximum;

directing a polarized probe beam at wavelength λ_1 onto said area of said dielectric material as said reflectivity changes to produce a reflected beam, wherein said reflected beam will be reflected at an intensity that is a function of said reflectivity change over time; and

detecting and recording the intensity change as a function of time, wherein said intensity change as a function of time corresponds to the rise time of said x-ray pulse.

2. The method of claim 1, wherein said wavelength λ_1 is directed at Brewster's angle of incidence onto said dielectric material at p-polarization, wherein said x-ray pulse has sufficient energy to alter the Brewster's angle reflectivity of said dielectric material at said wavelength λ_1, wherein said p-polarized probe beam is directed at said wavelength λ_1 at Brewster's angle of incidence onto said area of said dielectric material as said reflectivity changes to produce said reflected beam.

3. The method of claim 1, wherein said dielectric material comprises a diamond plate.

4. The method of claim 1, further comprising encoding time-related information spatially onto said probe beam.

5. The method of claim 1, further comprising encoding a linear gradient of arrival times on said probe beam by orienting said dielectric material at an angle relative to said x-ray pulse.

6. The method of claim 1, wherein the step of detecting comprises imaging said reflected beam onto a CCD detector array.

7. The method of claim 1, wherein the step of detecting comprises imaging said reflected beam onto a film.

8. The method of claim 1, wherein said dielectric material is selected from the group consisting of z-cut alpha quartz (SiO_2) and z-cut sapphire (Al_2O_3).

9. The method of claim 1, wherein time-varying reflectivity information is imprinted on both the transmitted and reflected beams.

10. The method of claim 1, wherein said dielectric crystal comprises an antireflection coating.

11. An apparatus for measuring the rise time of an x-ray pulse, comprising:

a dielectric material that has a material property of having zero effective reflectance at a wavelength λ_1 directed onto said dielectric material;

means for directing an x-ray pulse onto an area of said dielectric material to produce a reflectivity change in said dielectric material, wherein said x-ray pulse has sufficient energy to alter the reflectivity of said dielectric material at said wavelength λ_1, wherein said reflectivity changes from a minimum to a maximum;

means for directing a polarized probe beam at wavelength λ_1 onto said area of said dielectric material as said reflectivity changes to produce a reflected beam, wherein said reflected beam will be reflected at an intensity that is a function of said reflectivity change over time; and

means for detecting and recording the intensity change as a function of time, wherein said intensity change as a function of time corresponds to the rise time of said x-ray pulse.

12. The apparatus of claim 11, wherein said means for directing a polarized probe beam is adapted to direct wavelength λ_1 at Brewster's angle of incidence onto said dielectric material at p-polarization, wherein said means for directing an x-ray pulse is adapted to provide sufficient energy to alter the Brewster's angle reflectivity of said dielectric material at said wavelength λ_1, wherein said p-polarized probe beam is directed at said wavelength λ_1 at Brewster's angle of incidence onto said area of said dielectric material as said reflectivity changes to produce said reflected beam.

13. The apparatus of claim 11, wherein said dielectric material comprises a diamond plate.

14. The apparatus of claim 11, wherein said probe beam is spatially encoded with time-related information.

15. The apparatus of claim 11, wherein said dielectric material is oriented at an angle relative to said x-ray pulse to encode a linear gradient of arrival times on said probe beam.

16. The apparatus of claim 11, wherein said means for detecting comprises a CCD detector array onto which said reflected beam is directed.

17. The apparatus of claim 11, wherein the means for detecting comprises a film onto which said reflected beam is imaged.

18. The apparatus of claim 11, wherein said dielectric material is selected from the group consisting of z-cut alpha quartz (SiO_2) and z-cut sapphire (Al_2O_3).

19. The apparatus of claim 11, further comprising a transmitted beam that comprises the reciprocal intensity of said reflected beam, wherein both said transmitted beam and said reflected beam comprises time-varying reflectivity information.

20. The apparatus of claim 11, wherein said dielectric material comprises an antireflection coating.

19. The apparatus of claim 11, further comprising a transmitted beam that comprises the reciprocal intensity of said reflected beam, wherein both said transmitted beam and said reflected beam comprises time-varying reflectivity information.

20. The apparatus of claim 11, wherein said dielectric material comprises an antireflection coating.